



NEWSLETTER

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DISHA

MESSAGE FROM THE DEAN OF LIFE SCIENCE

'THE MEETING OF TWO PERSONALITIES IS LIKE THE CONTACT OF TWO CHEMICAL SUBSTANCES, IF THERE IS ANY REACTION, BOTH ARE TRANSFORMED'

CHEMISTRY IS IN YOU AND ALL AROUND YOU, EVERYTHING YOU SEE, TOUCH AND FEEL INVOLVES CHEMISTRY. ESSENTIALS OF LIFE THAT IS AIR, WATER AND FOOD INVOLVES CHEMISTRY. OUR BODY IS MADE UP OF CHEMICAL COMPOUNDS. THE EMOTIONS YOU FEEL ARE DUE TO CHEMICALS THAT IS NEUROTRANSMITTERS, LOVE, JEALOUSY, ENVY ALL ARE DUE TO THESE CHEMICALS. THUS CHEMISTRY AT LARGE INVOLVES

1. BODY COMPOSITION
2. CHEMISTRY OF EMOTIONS
3. CHEMISTRY OF FOOD - PHOTOSYNTHESIS
4. CHEMISTRY OF HYGIENE
5. CHEMISTRY OF FOOD PRESERVATION
6. CHEMISTRY OF DIGESTION
7. CHEMISTRY OF ENVIRONMENTAL BALANCE

HENCE CHEMISTRY IS ESSENTIAL, IT PLAYS A VITAL ROLE IN OUR LIVES AND MUST NOT BE NEGLECTED BY ANYONE



Dr. Anjali D'Souza

MESSAGE FROM THE HEAD OF DEPARTMENT

Welcome to the brand new edition of the annual news letter DISHA of Department of Chemistry. We are really proud and exuberant to acclaim that we are ready with all new hopes and hues to bring out this issue. The enthusiastic write ups of our young writers are undoubtedly sufficient to hold the interest and admiration of the readers. Having said that I take the opportunity to applaud the efforts of the student editors Divya and Anmol of MSc Chemistry Sem IV for their untiring efforts, time and dedication. I also acknowledge the initiatives taken by Dr. Manju Gupta for being a guiding force behind the news letter. Everyone has the desire to be successful academically because it is the key towards success in one's life. The last two years have been very challenging and incredibly difficult for students and faculty. The corona pandemic has created a huge divide between the teacher and taught. Students at large need to bounce back and focus primarily on their studies, career and prospective future. You need to have good preparation to successfully succeed in your studies by realistic planning, good organisation, effort, perseverance and a healthy lifestyle. This will maximise energy levels so that you can stay healthy and enhance your sense of confidence, concentration and understanding at the same time. There may be things in your life which are creating stress, and these can get in the way of being able to focus and concentrate. A good life balance is important as it reduces stress and makes us more resilient, more able to concentrate and calmer. May the lord bless you immensely with wisdom, health, happiness and peace. All the very best for your future.



CARBON DIOXIDE TURNED INTO METHANOL BY EXPLOITING DAILY TEMPERATURE CHANGES

An approach that could be used to furnish the sustainable fuel has been advanced. A new catalyst controls the energy correlated with daily temperature change and is used to convert $\text{CO}_2 \rightarrow \text{CH}_3\text{OH}$. Chinese scientist has come about with the catalyst that generates an electric current in response to temperature variation and then uses it to drive the conversion of $\text{CO}_2 \rightarrow \text{CH}_3\text{OH}$. The pyroelectric process depends on bismuth tungstate nanoplates that takes heat energy during temperature changes causing production of fuel using only the natural thermal changes during day and night cycles.

The project led by Guifu Zou Soochow University explains that most of the energy is wasted on daily basis of temperature change. This work reveals the idea to transform useable energy from the lost one by using pyroelectric materials to capture energy from temperature variation and convert to chemical energy.

The pyroelectric catalyst used here has natural electric field. Changes in temperature enables the ion to move within the crystalline material changing its polarization and producing current. The polarization results in temperature change in pyroelectric material which breaks the balance between spontaneous polarization and bound charge. In order to rebuild the balance, free charge is generated.

The bismuth tungstate nanomaterial could give methanol over 20 thermal cycles when operated at atmospheric pressure with temperature varying between 15°C and 70°C . Also, pyroelectric devices could achieve energy conversion about 92% which is 20% more efficient than the typically seen photovoltaic technologies.

Bismuth tungstate nanoplatelets with layered perovskite structure provides high surface area and high photoelectric and pyroelectric activity are suited for converting low grade waste heat into electrochemical energy. This finding way motivate forth research into using pyro electrochemical fuel cells to make more wide range of chemical feedstocks and fuels.

DIVYA BHANU SHRIVASTAV
M.Sc. CHEMISTRY (IV SEM)

THE CHEMISTRY OF BEVERAGES....

A. WHY IS COFFEE BITTER?

• Chlorogenic acids account for upto 8% of the composition of unroasted coffee beans. More than 40 different varieties have been identified in green coffee beans, with 5-caffeoylquinic acid the most prevalent. Chlorogenic acid content decreases when coffee beans are roasted, as they react to form quinoactones, phenylindanes and melanoidins. These contribute to flavour and bitterness.



B. TEA

Polyphenols in tea –

- A strong cup of tea contains around 180-240 mg of polyphenol compounds. Compounds called catechins are the building blocks of black tea polyphenols; they are oxidised to form theaflavins and thearubigens.
- Theaflavins comprise of 3-5% of black tea, and are responsible for its red-orange appearance.



Shivani Verma
B.Sc. IInd Year
Biotechnology



NOBEL PRIZE IN CHEMISTRY 2021

The chemistry laureates

Their tools revolutionised the construction of molecules. The nobel prize in chemistry 2021 is awarded to

BENJAMIN LIST
and
DAVID MACMILLAN

"for the development of asymmetric organocatalysis".



NOTABLE CHEMISTRY DISCOVERIES



1. LOUIS PASTEUR CREATED THE FIRST VACCINE.

- In the 19th century, the French chemist's work in germ theory led to vaccinations for anthrax and rabies. Pasteur became widely recognized in 1885 when he vaccinated Joseph Meister, a 9-year-old boy who had been bitten by a rabid dog.
- After coming up with the process of pasteurization, where bacteria are killed by heating beverages and then allowing them to cool, Pasteur saved the beer, wine, and silk industries in France.

2. PIERRE JEAN ROBIQUET DISCOVERED CAFFEINE.

- Aside from isolating caffeine in 1821, French chemist Robiquet also identified the properties of codeine, which is a powerful molecule used in medicine as a cough suppressant and analgesic drug.

3. IRA REMSEN DEVELOPED THE FIRST ARTIFICIAL SWEETENER.

- A former president of Johns Hopkins University, Remsen is credited with the discovery of the popular artificial sweetener known as saccharin. Today, saccharin is widely used in the U.S., sweetening everything from diet soft drinks to toothpaste.

4. ROBERT BUNSEN INVENTED THE APTLY NAMED BUNSEN BURNER.

- Chemistry students everywhere owe their ability to heat beakers and Erlenmeyer flasks in lab to German chemist Bunsen.
- While the laboratory burners were already in use when Bunsen came along — one of the earliest prototypes is credited to English scientist Michael Faraday — Bunsen's improvements to the design were considered most effective. In addition to refining the popular lab tool, Bunsen also helped pioneer the use of spectroscopy in chemical analysis.

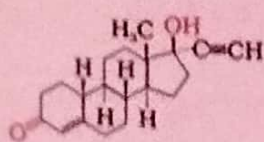
5. WALLACE CAROTHERS DISCOVERED NYLON.

- Carothers and his team at the DuPont chemical company produced their first durable and flexible strand of a synthetic polymer fibre. DuPont patented the thread as "nylon" in 1935, and Carothers became the first organic chemist to be elected to the National Academy of Sciences.

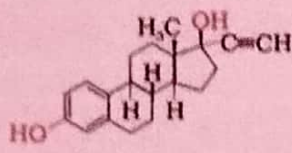
Garima Dolani
M.Sc. Chemistry
IV Sem

CHEMISTRY BEHIND ANTI-FERTILITY DRUG.....

The global increase in population and its consequences are known to all. Hence, family planning is necessary. "Antifertility drugs" are chemical substances which suppress the action of hormones that promote pregnancy. Since they are made up of derivatives of synthetic progesterone or a combination of derivatives of estrogen and progesterone. Since they all are derivative of estrogen and progesterone and can be prepared in labs synthetically and can be used as a contraceptive pills by women to control birth. So, the importance of these pills are much that it can help in population control to a very large extent.



Norethindrone



Ethynylestradiol (novestrol)



The basic is chemistry behind it. They are cyclic compounds and contain various functional groups. The only thing is they should be taken after consulting to the doctor. Also these drug be taken in proper amount the amount should be appropriate otherwise, side effects are reported. The cycle of medicine should be maintained. The chance of cancer in uterus is reduced if pills are taken in long term dose. They also provide protection against pelvic inflammatory diseases. Progesterone acts as an antifertility, anti-inflammatory drug and regulates the immune system. Ex.-Novestrol is an antifertility drug histamine is an organic nitrogenous compound found in some body cells. Its not a drug. It can act as a neurotransmitter for the brain, spinal cord and uterus. Also, it can react with Br_2 , water, $ZnCl_2$ and HCl . Due to pressure of unsaturation due to $-OH$ group and due to phenol. Hence every student must be aware about the chemistry behind it.

Anushka Mishra
B.Sc. (IAMB) First Year



Do you know?

"The human body contains enough carbon to provide 'lead' (which is really graphite) for about 9,000 pencils!"

Here are some more facts :-

1. When you feel hungry the hormone Ghrelin is secreted by the stomach that triggers hunger. It stimulates the release of the growth hormone. It plays a role in the release of Insulin and protection of the cardiovascular organs. So, the next time your stomach growls grab a bite because if you fast or skip meals, more Ghrelin is produced thus increasing your craving for food.
2. Sometimes, crying is a natural reflex. Studies have shown that emotional tears contain more manganese, an element that affects temperament and more prolactin. Prolactin is a hormone that regulates milk production. This elimination of manganese and prolactin is thought to ease out tension building up in the body and you feel energized and rejuvenated. So, the next time you feel low and need to vent your emotions, don't hold back. Just cry! It will help you feel better.
3. We fall in love or are attracted to someone and have a feeling of belonging due to an increase in the secretion of Phenylethylamine (PEA, or the "love chemical") When we fall in love, our brain releases dopamine, norepinephrine and pheromones consistently, which evoke the pleasure center in the brain leading to side effects such as increased heart rate, insomnia, an intense feeling of excitement, elation, and focused attention.
4. Perspiration is a way in which the body cools itself. Body odor mainly originates from the Apocrine glands, which are found in the armpits, ears, breasts, the genitals, and hair follicles that become active at the onset of puberty. The sweat that these glands release is slight yellow in color due to the presence of fatty acids and proteins in it. The bacteria that thrive on our skin break down the secretions of the Apocrine glands and create smelly odors.
5. Apples contain an enzyme called polyphenol oxidase (PPO), also known as tyrosinase. Cutting an apple exposes its cells to the atmospheric oxygen and oxidizes the phenolic compounds present in apples. This is called the enzymatic browning that turns a cut apple brown. In addition to apples, enzymatic browning is also evident in bananas, pears, avocados and even potatoes.
6. Sunscreens are a combination of organic and inorganic compounds. Inorganic chemicals, like titanium dioxide or zinc oxide, form a physical barrier that reflects or scatters UV waves. Organic components like octyl methoxycinnamate (OMC) or oxybenzone absorb UV rays and release their energy as heat. This protects our skin from sunburns and detrimental effects like cancer.
7. Every hydrogen atom in your body is likely 13.5 billion years old because they were created at the birth of the universe. At ground zero, during the Universe's singularity, the very first chemical element was hydrogen. All the other followed by fusing hydrogen into helium, which then fused into carbon and so on. Approximately 73% of the mass of the visible universe is in the form of hydrogen. Helium makes up about 25% of the mass, and everything else represents only 2%. By mass, hydrogen and helium combined make up less than 1% of the Earth.
8. Chocolates that we eat contain Phenylethylamine. A similar chemical discharges from the human brain when we fall in love.
9. The most expensive material in the world is Antimatter, which costs 25\$ for 1 gram only. Just 1gm is enough to destroy the whole of New York City.
10. The football-shaped carbon cluster C₆₀ has been called 'the most beautiful molecule', and if you have an eye for symmetry it's easy to understand why.

Anmol Sen

M.Sc. Chemistry IV Sem



Snavi Patel, B.Sc. CBZ III Year

